

Engineering Investigation of the Bunker Hill Basin 2021-2022

Figures

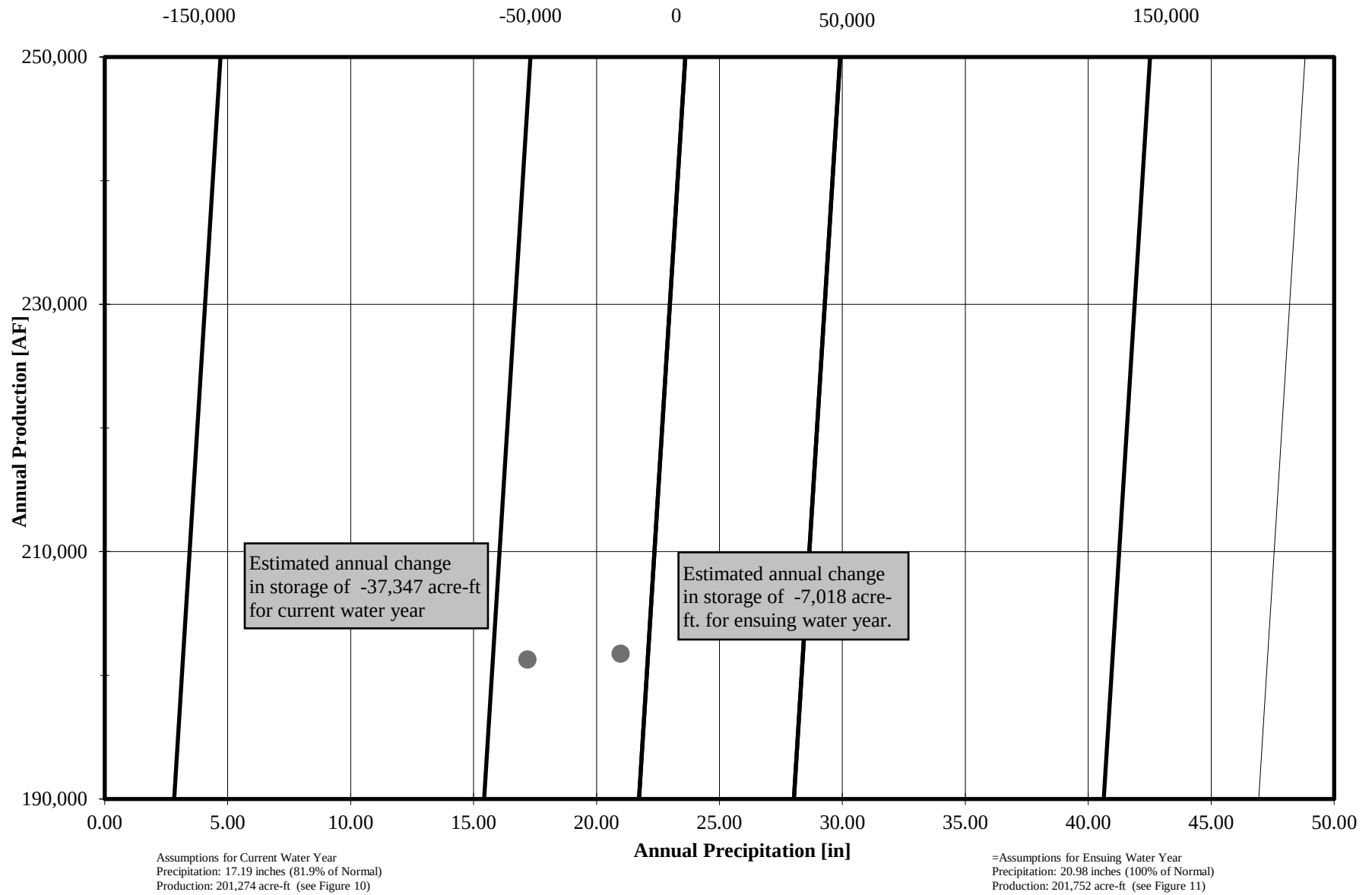


**San Bernardino Valley
Water Conservation District**

Helping Nature Store Our Water

Prediction Chart for Annual Change in Storage

Current and Ensuing Water Years



* Based on Big Bear Dam, Camp Angelus, Devore CDF, Lake Arrowhead, Mentone CDF
Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

$$\text{Change in Storage} = -115,169 + 8,033 * \text{Precipitation} - 0.30 * \text{Production} \quad (R^2 = 0.75)$$

Figure 1: Project Area Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 1, 2023



**San Bernardino Valley
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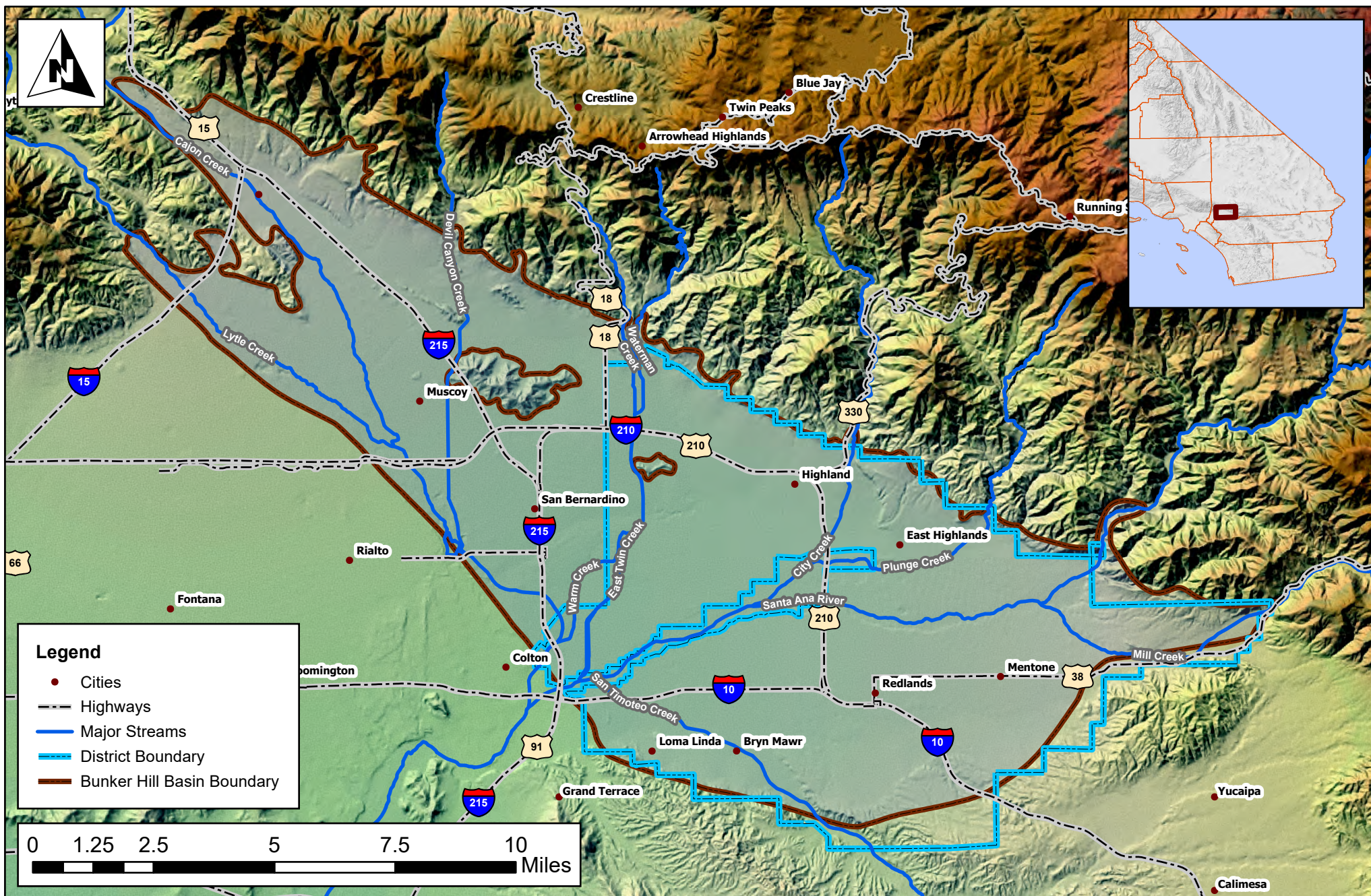


Figure 2: District and Water Agency Boundaries Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
January 2, 2023



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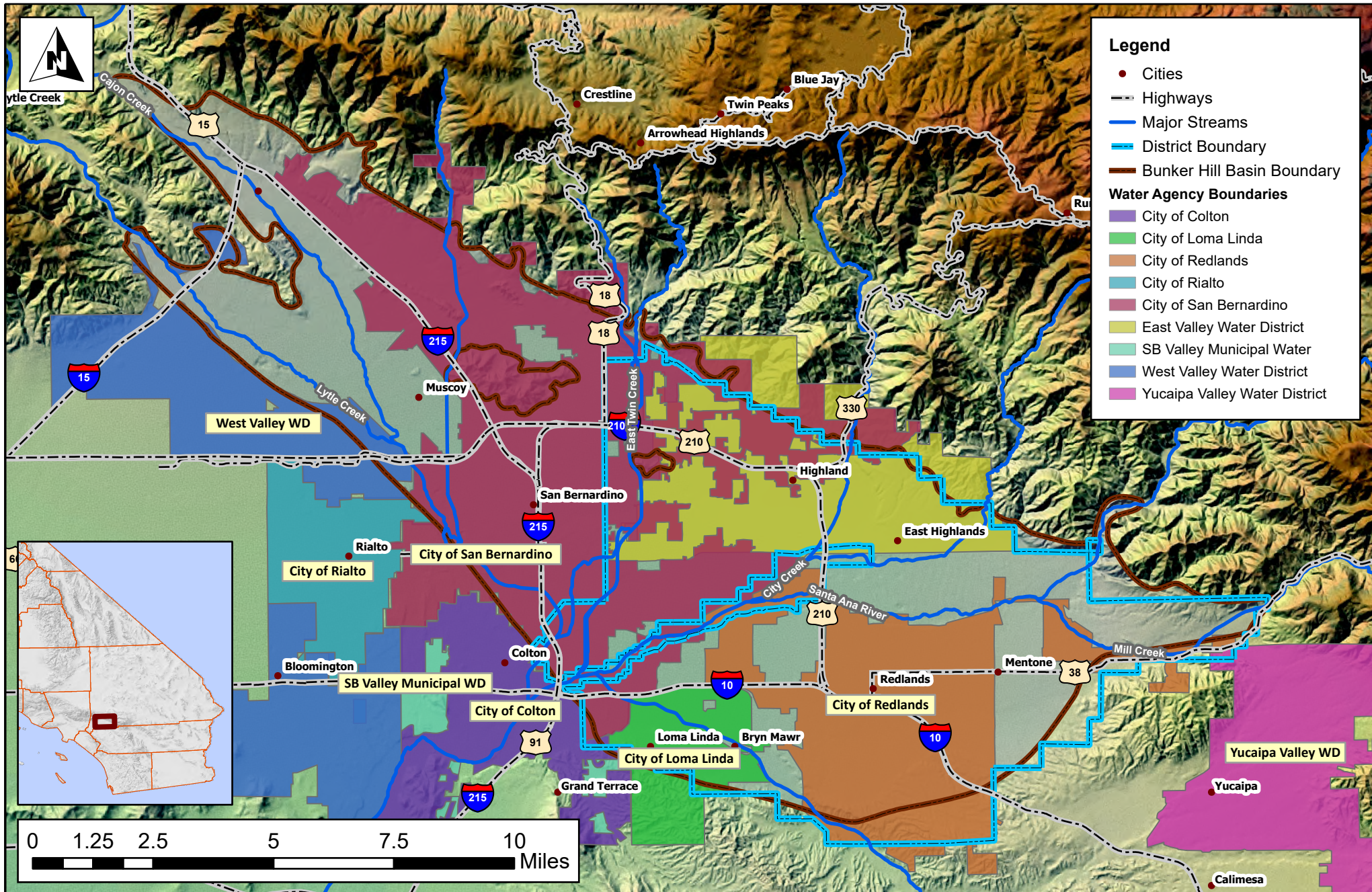


Figure 3: Bunker Hill Sub Basins Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
January 2, 2023



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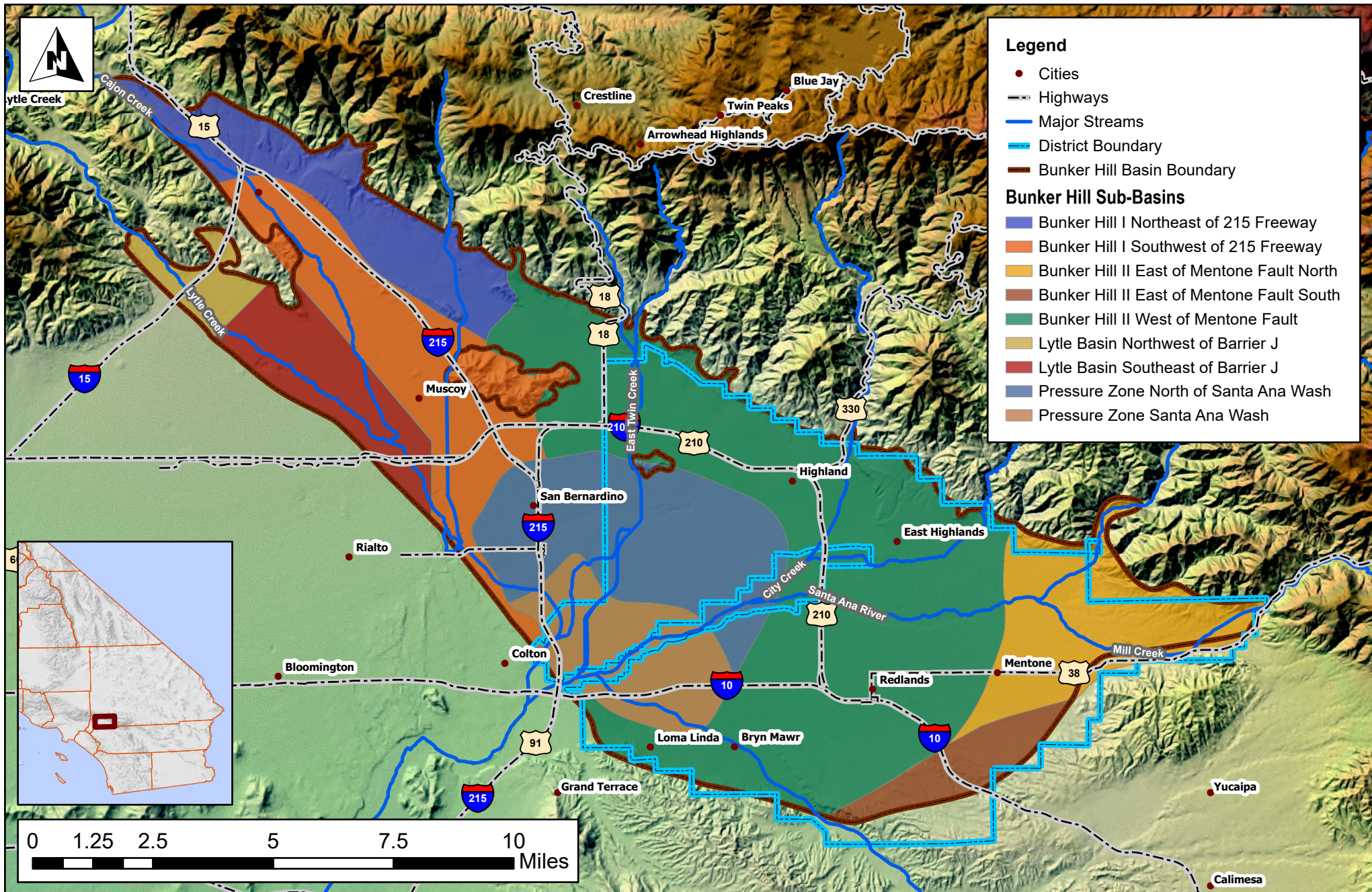


Figure 4: Precipitation Trends and Station Locations October 2021 - September 2022 Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 2, 2023



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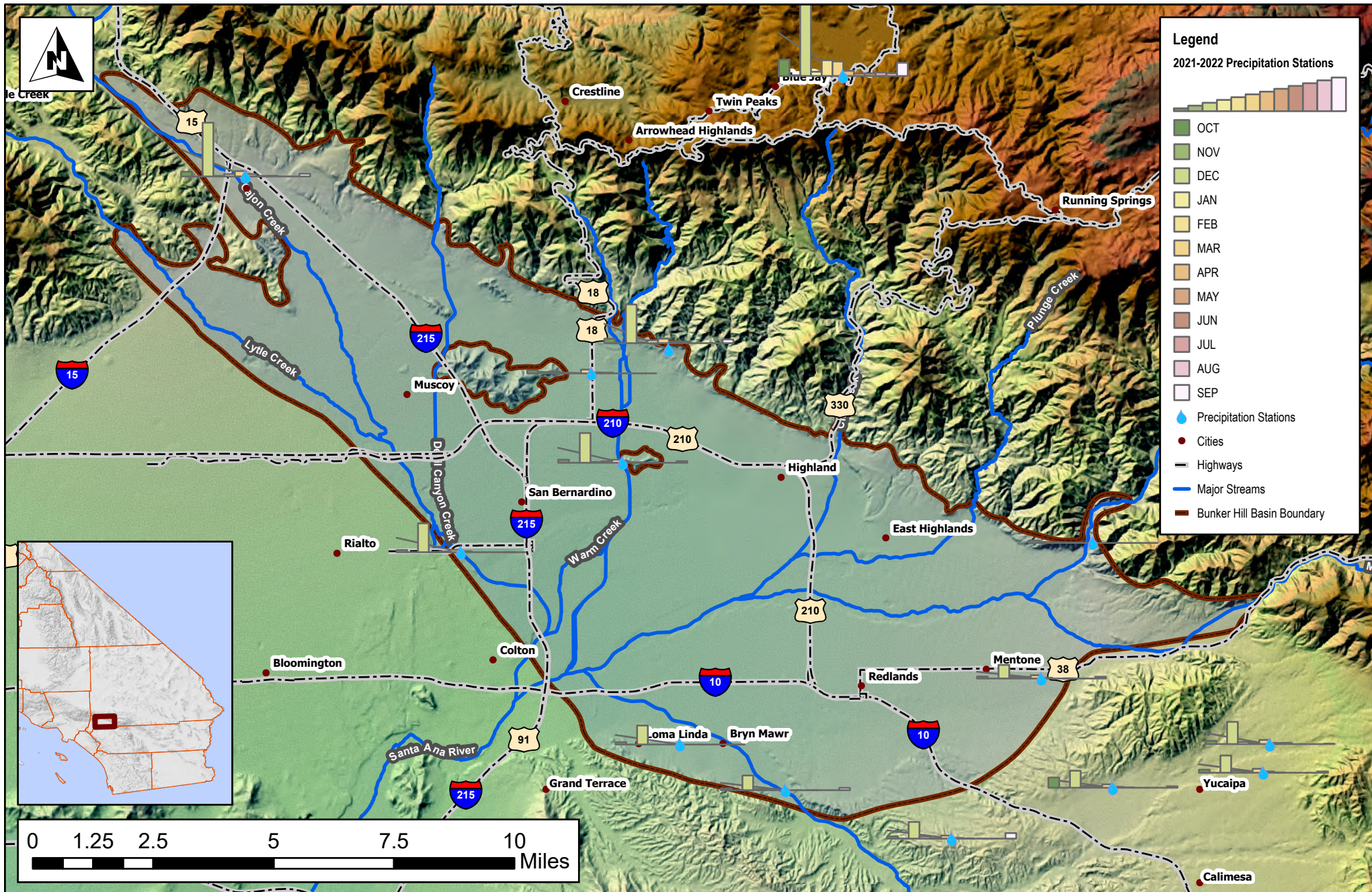


Figure 5: Water Elevation Contour Surface Fall 2021
Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & A. Frey
February 2, 2023



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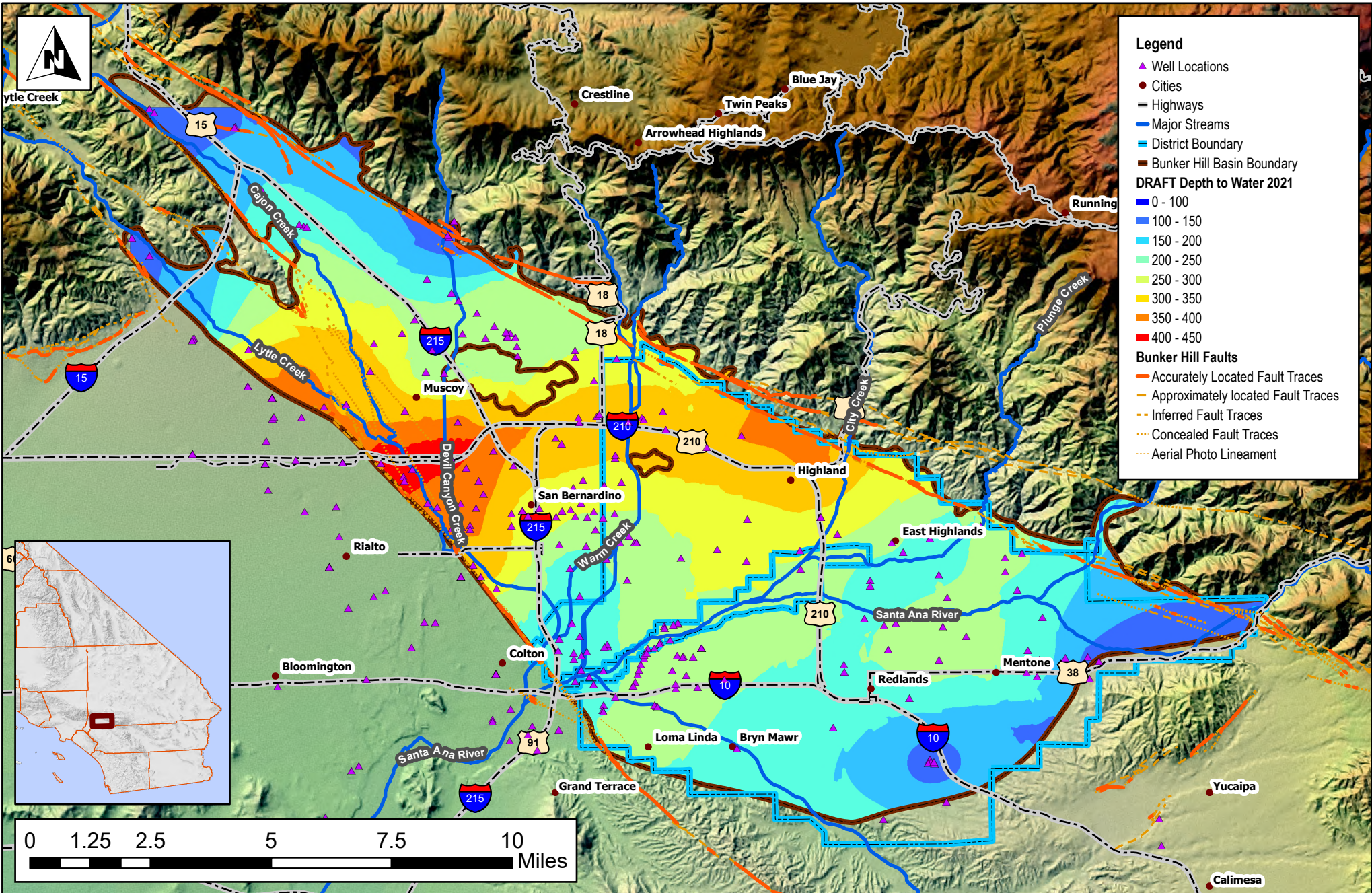


Figure 6: Water Elevation Contour Surface Fall 2022
Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & A. Frey
February 2, 2023



**San Bernardino Valley
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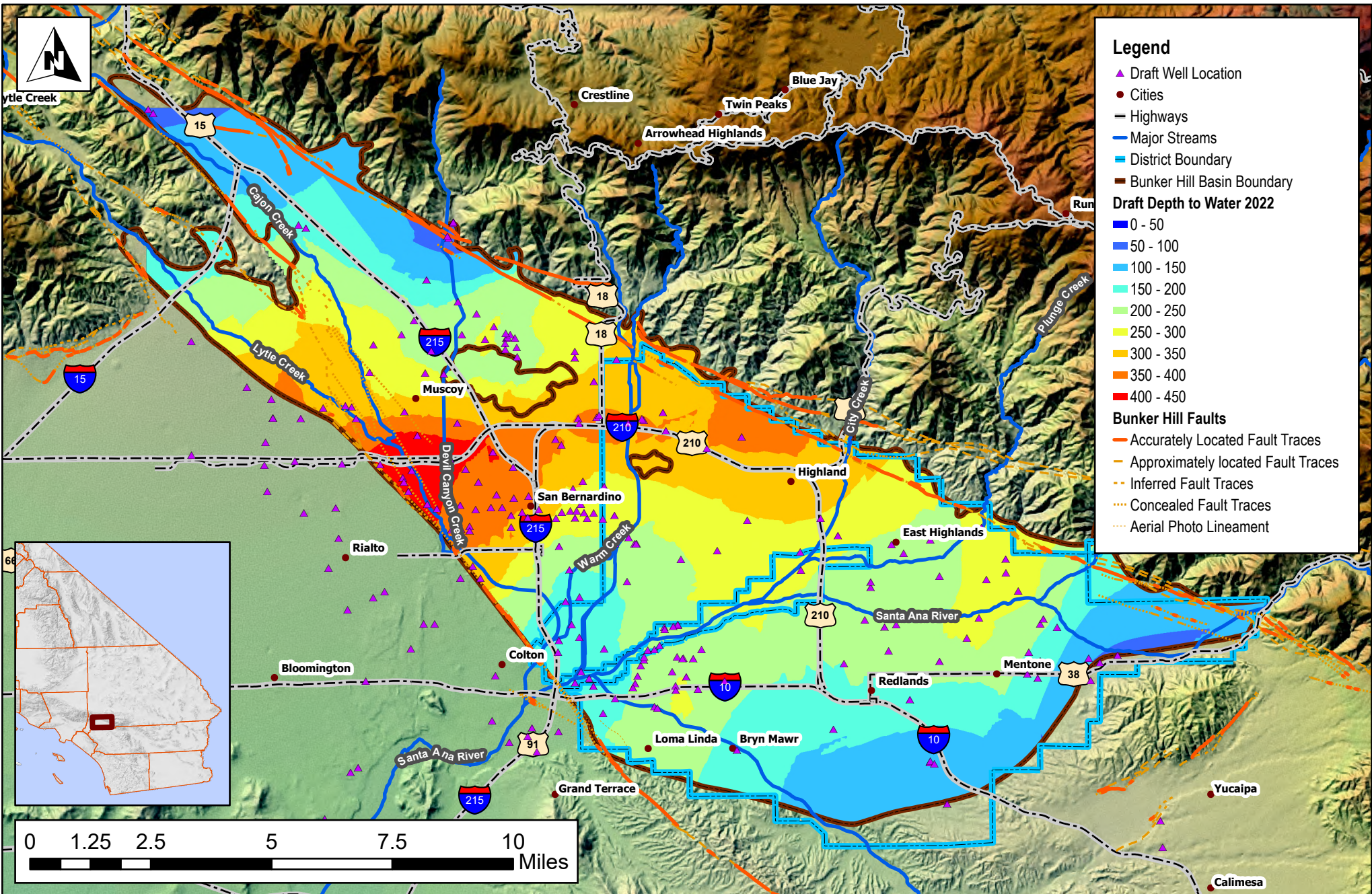


Figure 7: Key Wells (Appendix B Hydrographs) 2021-2022 Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVMWD, CASIL, SBVMWD
GIS Contact: K. Scholte
January 2, 2023



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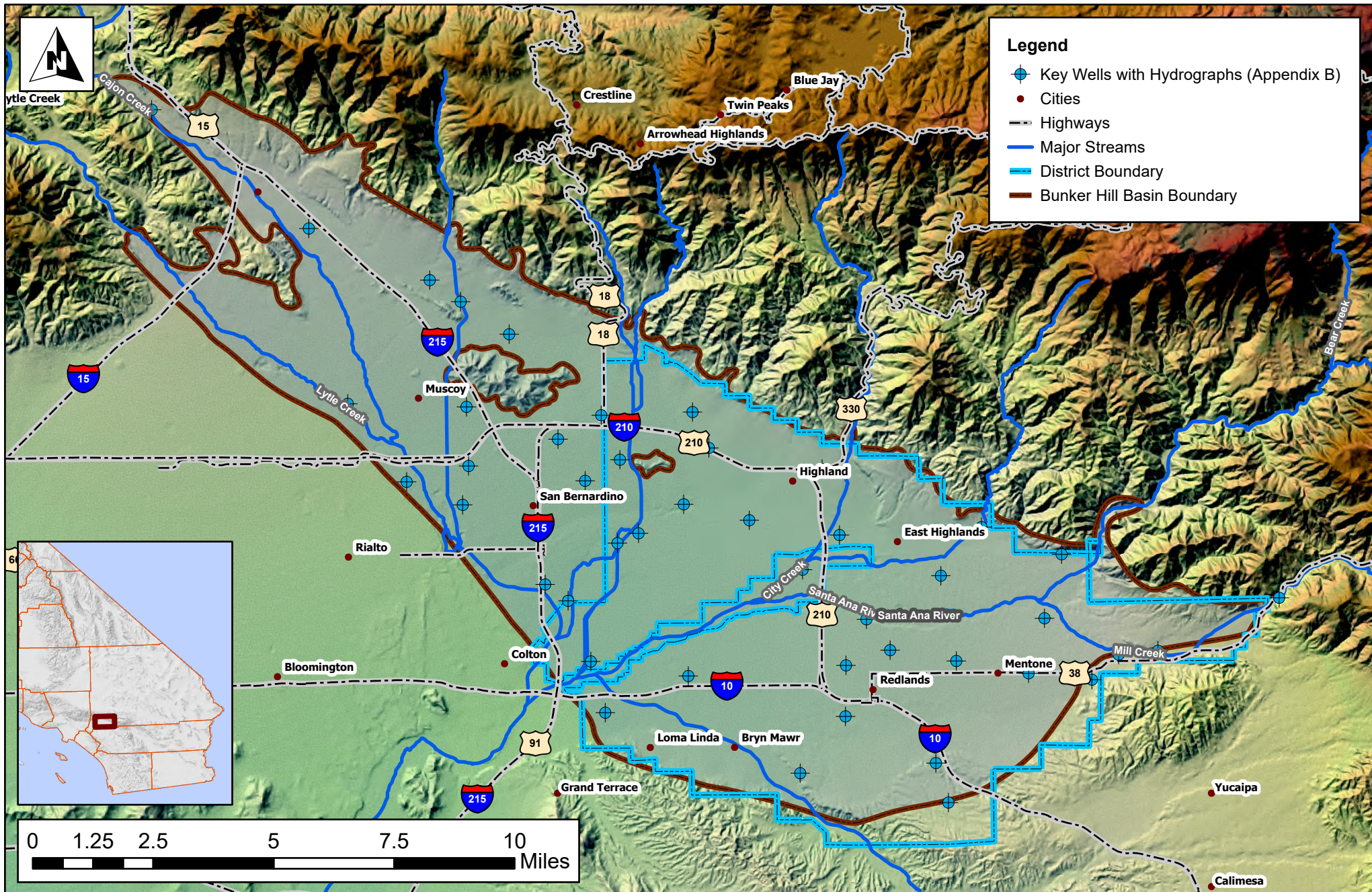
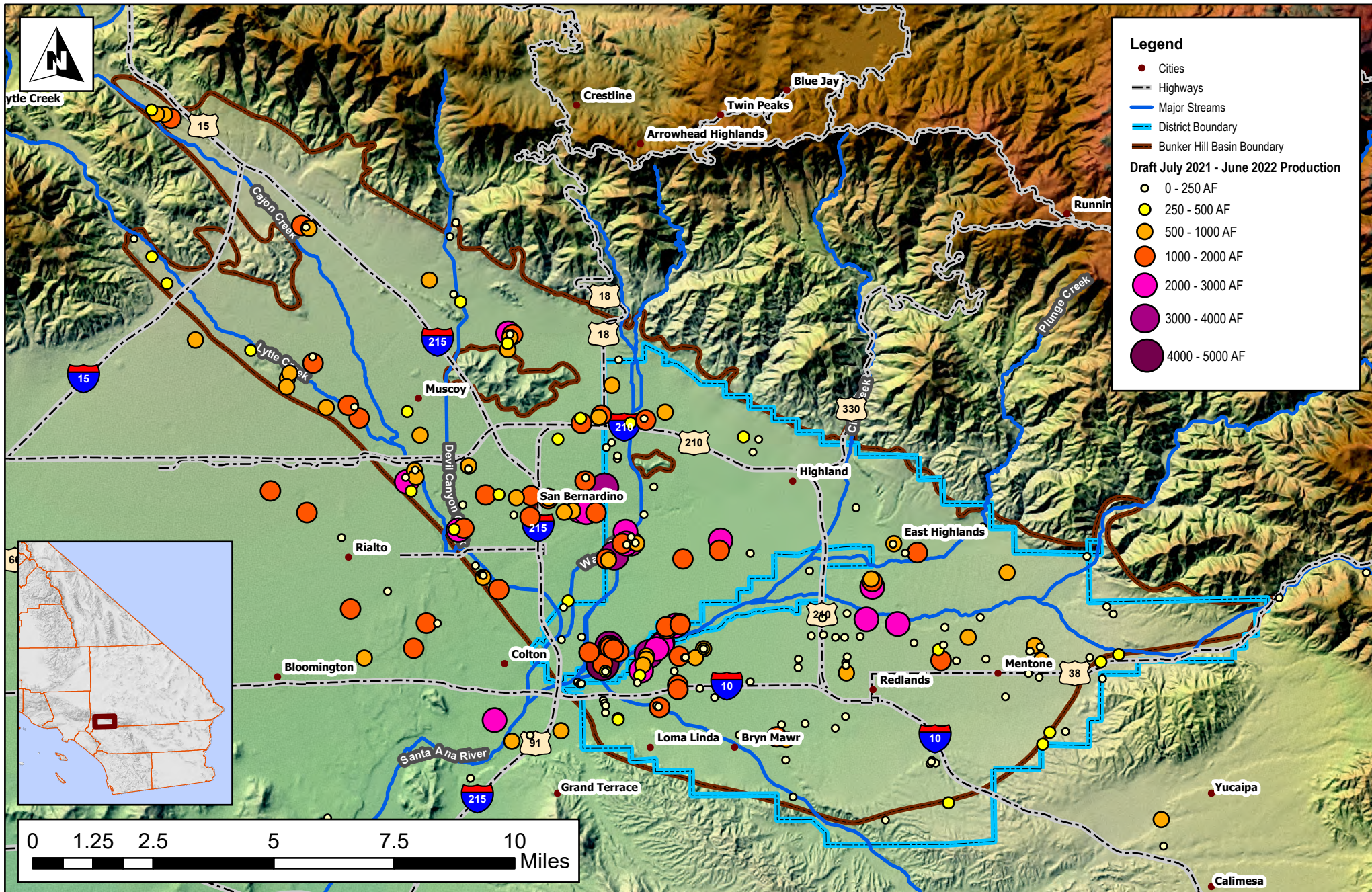


Figure 8: Groundwater Production Bunker Hill Basin Total Well Production for July 2021 - June 2022 Engineering Investigation Report 2023

Coordinate System:
NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Source: SBVWCD, CASIL, SBVMWD
GIS Contact: K. Scholte & L. Torres
February 2, 2023

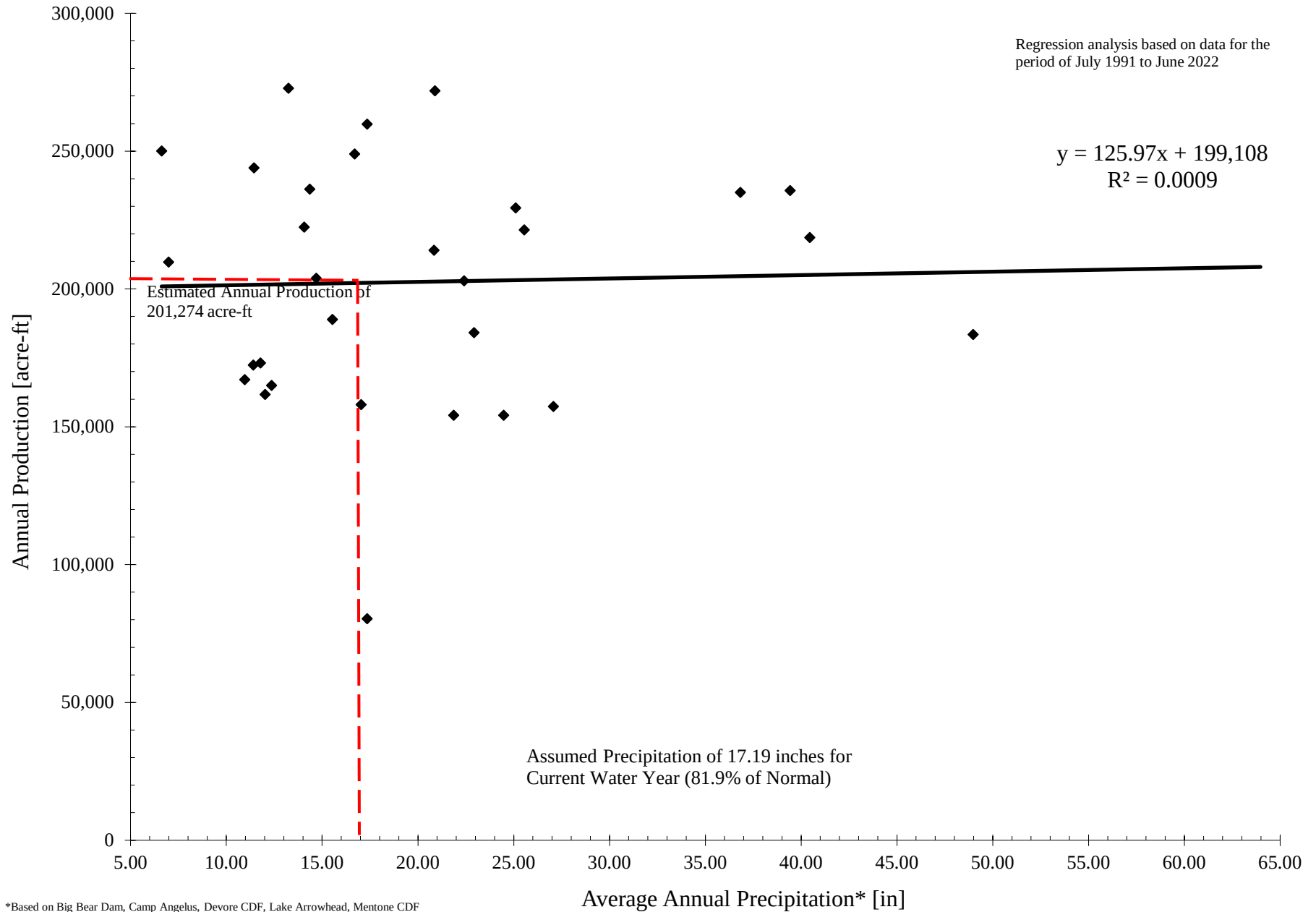


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Estimate of Production for Current Water Year

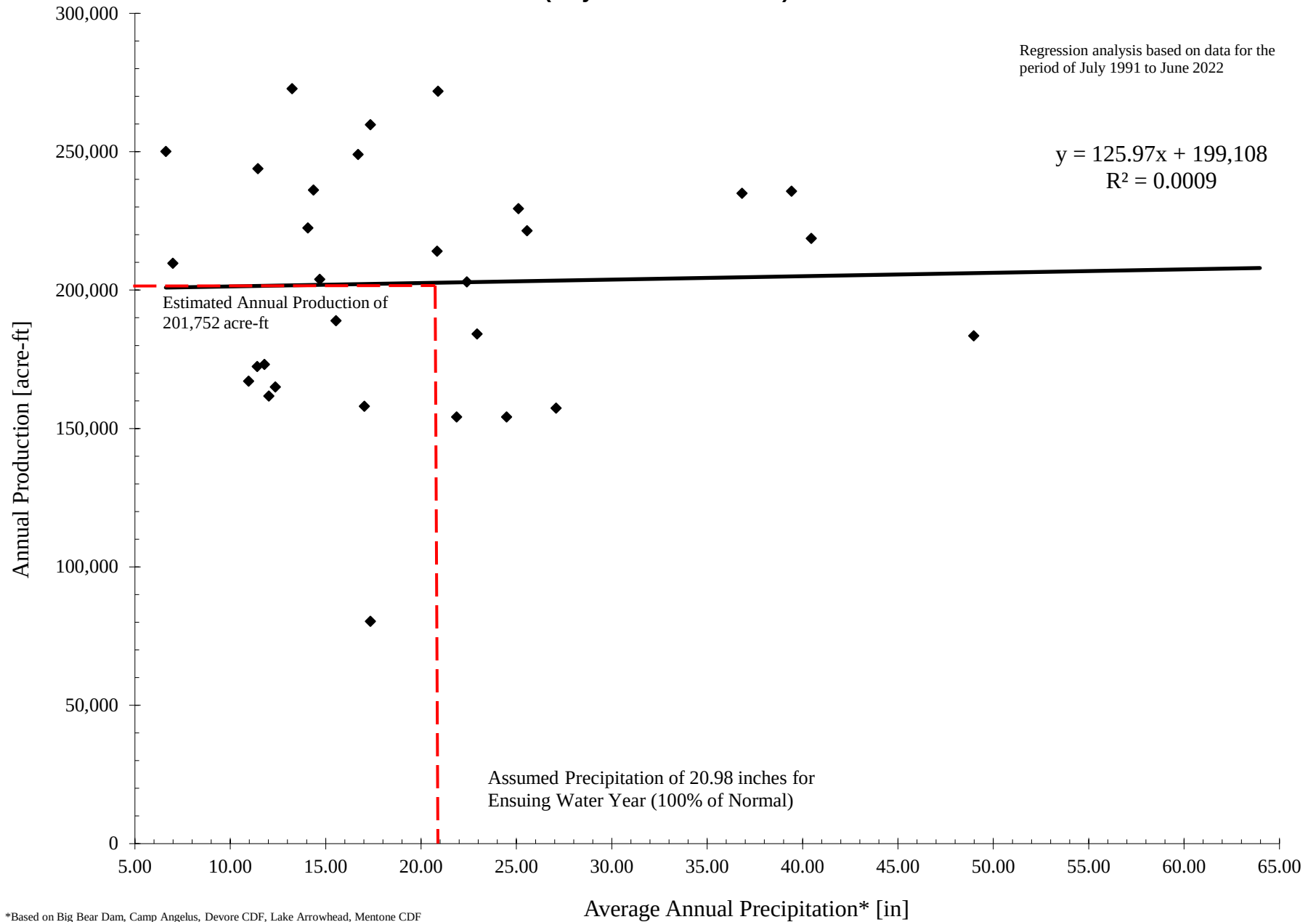
(July 2022 to June 2023)



*Based on Big Bear Dam, Camp Angelus, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

Estimate of Production for Ensuing Water Year

(July 2023 to June 2024)



*Based on Big Bear Dam, Camp Angelus, Devore CDF, Lake Arrowhead, Mentone CDF, Redlands Country Club, San Bernardino County Hospital, Santa Ana Powerhouse #3, and Yucaipa CDF.

Engineering Investigation of the Bunker Hill Basin 2021-2022

Tables



**San Bernardino Valley
Water Conservation District**

Helping Nature Store Our Water

Summary of Percentage of Normal Precipitation

1991
to 2022
(Water Year - Oct. to Sept.)

Station	Historic Annual Avg. [in]	1991 -1992 [in]	1992 -1993 [in]	1993 -1994 [in]	1994 -1995 [in]	1995 -1996 [in]	1996 -1997 [in]	1997 -1998 [in]	1998 -1999 [in]	1999 -2000 [in]	2000 -2001 [in]	2001 -2002 [in]	2002 -2003 [in]	2003 -2004 [in]	2004 -2005 [in]	2005 -2006 [in]	2006 -2007 [in]	2007 - 2008 [in]	2008 - 2009 [in]	2009- 2010 [in]	2010 - 2011 [in]	2011 - 2012 [in]	2012 - 2013 [in]	2013 - 2014 [in]	2014 - 2015 [in]	2015 - 2016 [in]	2016 - 2017 [in]	2017 - 2018 [in]	2018 - 2019 [in]	2019 - 2020 [in]	2020 - 2021 [in]	2021 - 2022 [in]	Each Station 30 Yr. Avg. [in.]
Big Bear City	14.23	14.58	26.01	10.28	19.41	13.28	11.59	20.64	7.42	5.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	10.21	14.62	19.55	25.33	16.27	10.46	8.54	9.28	11.18	21.09	7.79	23.37	7.73	8.89	19.09	11.02
Big Bear Dam	32.25	31.90	69.70	27.60	52.40	24.40	18.60	54.30	14.20	20.60	21.40	9.20	38.10	19.60	59.10	26.40	10.30	23.10	19.70	26.00	20.20	10.44	5.19	11.72	20.40	17.32	19.88	31.27	50.19	45.73	20.21	43.89	27.84
Camp Angelus	23.33	28.16	0.00	17.20	46.70	26.00	30.50	55.30	16.10	21.10	21.51	7.70	35.40	13.20	35.20	41.90	0.00	2.70	18.00	18.80	1.70	16.82	9.03	10.62	41.01	11.22	36.29	16.45	45.56	27.92	12.80	24.20	22.23
Crafton Hills	13.48	14.88	28.18	11.26	27.22	9.13	16.67	25.55	7.29	6.40	10.49	2.46	17.57	9.47	31.39	11.45	3.34	13.34	9.90	17.80	24.52	9.57	9.69	6.55	13.06	10.56	19.12	6.27	18.26	17.32	7.81	10.3	13.77
Del Rosa Ranger Station	17.64	24.24	41.39	12.30	27.69	14.21	17.31	37.26	8.30	12.73	16.60	6.09	19.69	13.02	38.55	17.40	8.77	17.80	13.61	22.01	30.84	11.68	2.22	4.54	6.75	6.32	24.37	9.06	27.381	15.87	10.35	16.21	17.24
Devore CDF	26.17	31.50	65.45	19.66	39.77	23.96	33.10	52.69	13.61	8.04	15.52	10.90	35.35	16.44	60.36	24.80	8.86	25.22	16.51	34.12	43.20	17.47	14.50	13.81	18.14	15.29	35.05	12.21	39.471	22.03	8.35	20.29	25.67
Fallsvale	28.98	36.00	71.90	52.00	54.90	22.10	33.80	53.00	16.30	19.20	15.30	6.50	37.50	19.80	59.70	26.90	11.10	29.30	25.00	2.85	29.51	22.90	14.10	26.3	25.58	22.314	47.64	20.77	48.7	39.96	15.39	35.24	30.37
Lake Arrowhead	36.64	43.21	19.27	10.04	62.60	32.70	36.50	72.80	18.10	25.80	28.60	10.70	36.50	22.70	66.40	29.50	13.60	40.40	30.30	46.00	37.76	25.10	21.30	26.7	14.733	24.3	48.81	17.27	50.816	40.3	29.07	46.64	33.18
Loma Linda FD	10.75	12.57	24.27	10.81	21.17	8.65	9.78	22.74	5.12	7.74	6.38	2.45	14.48	8.06	22.59	11.06	3.51	9.64	8.95	13.10	18.24	6.79	6.42	9.06	9.5	7.86	16.13	5.91	17.36	15.17	7.16	8	11.31
Lytle Creek at Foothill	12.92	14.91	31.59	9.16	25.51	12.23	13.83	25.84	6.25	9.81	12.12	4.00	13.60	7.16	27.23	11.22	3.84	11.89	8.12	13.03	21.63	6.90	4.51	8.34	10.18	7.04	18.247	4.99	15.32	10.79	6.68	10.04	12.45
Lytle Creek Fire Station	22.31	49.09	87.71	20.50	47.57	24.49	23.10	52.18	11.81	20.40	18.34	4.47	16.96	12.09	44.11	18.92	4.22	21.89	3.32	0.00	28.46	8.18	7.33	8.03	9.07	13.57	31.02	11.902	36.02	24.46	6.77	16.88	22.03
Mentone CDF	12.28	14.57	27.40	11.68	23.25	9.42	15.50	27.09	4.28	9.08	10.16	4.06	15.00	10.38	24.94	11.01	5.41	10.76	9.39	14.96	17.77	7.90	7.33	3.11	0.89	8.57	15.14	5.28	16.22	14.37	7.01	6.86	11.90
Oak Glen	23.90	30.78	57.96	18.76	57.92	20.04	30.39	49.46	11.32	17.12	11.24	6.72	14.28	18.39	34.14	22.58	9.71	27.54	18.11	29.72	36.82	15.13	15.69	14.07	20.54	18.78	16.04	7.44	34.06	23.05	8.88	15.01	22.96
Redlands - Roth	11.29	14.96	25.57	10.06	20.49	8.08	10.77	22.29	6.46	7.41	10.38	3.35	12.18	9.16	24.43	9.52	3.31	9.46	8.91	15.12	17.38	4.34	1.54	2.08	2.72	1.7	14.42	5.43	14.74	13.776	6.63	6.07	10.41
Redlands Country Club	12.09	14.58	26.96	11.90	15.76	0.65	9.03	17.22	6.30	5.68	9.96	3.97	16.45	11.58	29.37	10.30	4.13	11.93	11.35	17.25	22.33	8.84	8.82	6.92	10.37	8.61	16.9	5.53	16.12	6.27	6.23	8.64	11.61
San Bernardino CDF	16.47	21.89	37.35	4.46	20.29	15.77	16.17	34.32	9.30	13.62	16.61	5.29	13.14	11.54	37.28	16.39	6.33	18.91	10.73	20.45	27.94	10.63	7.69	11.3	11.19	10.91	23.3	7.99	23.48	13.65	8.88	4.62	15.85
San Bernardino Co. Hospital	15.86	18.09	34.44	12.40	25.94	11.94	17.80	32.67	8.02	11.09	2.43	3.60	17.06	10.49	29.89	13.20	4.68	12.81	9.96	17.03	21.76	9.58	9.36	10.97	10.97	8.96	19.15	6.67	5.7	13.18	12.84	11.41	14.00
Santa Ana Pumphouse #3	15.92	18.28	36.68	14.00	24.85	11.05	16.60	27.95	7.01	6.78	8.63	3.23	18.24	9.40	27.65	11.78	6.13	10.73	9.75	14.58	20.18	8.62	9.12	7.42	9.57	9.29	16.47	6.762	20.07	14.98	8.62	5.94	13.56
Yucaipa CDF	14.49	19.37	34.60	10.00	14.70	10.89	16.06	24.70	7.63	11.10	9.92	5.66	19.47	11.84	32.70	13.14	6.56	14.67	12.11	18.79	25.09	11.80	5.25	4.45	12.49	11.11	17.18	6.47	20.341	14.7	6.06	9.99	14.16
Yucaipa Valley Water District	15.09	16.80	32.37	11.35	28.54	10.19	16.93	28.60	9.87	9.63	9.65	5.27	19.50	11.10	32.73	12.52	5.53	14.79	10.47	17.68	22.74	10.80	9.60	7.58	12.39	10.31	18.38	6.48	19.73	16.53	5.14	9.71	14.61
Percent of Normal	100%	125%	207%	81%	175%	82%	105%	196%	52%	66%	68%	28%	109%	65%	191%	90%	32%	90%	71%	101%	131%	64%	48%	54%	71%	63%	126%	54%	144%	106%	54%	87%	95%

Total Station Average	18.80
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Source: San Bernardino County Department of Transportation/Flood Control

Change in Groundwater Levels in Key Wells

Fall 2021 to Fall 2022

WCD Code	Recordation Number	State Well Number	Well Name	Owner Or Measuring Agency	2021 Depth To Water (ft)	2022 Depth To Water (ft)	Difference Fall 2021 to Fall 2022
1865	3601675	1N4W25A01S	27	East Valley Water District	237.0		
1984	3602113	1N3W30N01S	41	East Valley Water District	336.0	355.0	-19.0
1364	3600026	1S3W04J01S	102	East Valley Water District	255.0	271.0	-16.0
1401	3600220	1S3W01H01S	142 Mt. Harrison	East Valley Water District	252.0	280.0	-28.0
1660	3601184	1N3W33F01S	94 Corwin	East Valley Water District	409	423	-14.0
1851	3601660	1S3W06H04S	9A	East Valley Water District	252.0	269.0	-17.0
1010	9900021	1S3W09E02S	Tri-City Concrete	East Valley Water District	250.0	275.0	-25.0
2271	3602855	1S4W25D07S	Anderson III	Loma Linda University	261	265.5	-4.5
1727	3601308	1S2W19K01S	Agate #1	Redlands, City of	150.0	160.0	-10.0
1708	3601283	1S2W22C02S	E. Lugonia #2	Redlands, City of			
1712	3601287	1S2W21B02S	E. Lugonia #3	Redlands, City of	30.0	42.0	-12.0
1714	3601290	1S2W21D01S	E. Lugonia #6	Redlands, City of	57.0	54.0	3.0
1970	3602065	1S3W32J02S	Lee Well	Redlands, City of			
1706	3601281	1S2W36F01S	Maguet #1	Redlands, City of	26.0	27.0	-1.0
1709	3601284	1S2W21E01S	Maguet #2	Redlands, City of	53.0	62.0	-9.0
1707	3601282	1S1W08H01S	Mill Creek #1	Redlands, City of			
1819	3601586	1S3W15F01S	Orange Street	Redlands, City of	171.0	190.0	-19.0
1591	3600918	2S3W01E01S	Redlands Heights	Redlands, City of	179.0	183.0	-4.0
1718	3601294	1S3W35G09S	Well #13	Redlands, City of	62.0	63.0	-1.0
1720	3601296	1S3W35H03S	Well #16	Redlands, City of	43.0	44.0	-1.0
1722	3601298	1S3W21H01S	Well #32	Redlands, City of			
1723	3601299	1S4W24K01S	Well #34	Redlands, City of	236.0	256.0	-20.0
1964	3602032	1S3W22A02S	Well #35	Redlands, City of	234.0	255.0	-21.0
1725	3601301	1S3W28H01S	Well #41	Redlands, City of			
1702	3601263	1N5W23Q01S	City 1	Rialto, City of	247.0	257.0	-10.0
1668	3601225	1S4W02P02S	Cooley D	Riverside, City of	232.4	240.4	-8.1
1662	3601218	1S4W14P02S	Raub 1	Riverside, City of			
1677	3601234	1S4W27A19S	Stewart 19	Riverside, City of	194.8		
1744	3601431	1S4W27H01S	Stewart 20	Riverside, City of	187.6	205.3	-17.7
1767	3601478	1S4W22B03S	Thorn 10	Riverside, City of			
1683	3601240	1S4W22H04S	Warren 1	Riverside, City of			
1554	3600787	1S4W23A02S	26-1	Riverside, City Of-Gage Canal	201.0	201.0	0.0
2291	229101	1S2W07B01S	SBVWCD #1	San Bernardino Valley Water Cons. Dist.			
2290	229001	1S2W07K01S	SBVWCD #2	San Bernardino Valley Water Cons. Dis	211.6	215.1	-3.5
2286	228601	1S3W12J01S	SBVWCD #3	San Bernardino Valley Water Cons. Dis	225.3	255.6	-30.3
2288	228801	1S3W11H01S	SBVWCD #4	San Bernardino Valley Water Cons. Dis	178.8	208.0	-29.3
1525	3600725	1N4W34G01S	17th & Sierra Way #2	San Bernardino, City of			
1517		1N4W32D03S	19th Street No. 1	San Bernardino, City of	389.3	391.3	-2.0
1520	3600720	1N4W27M02S	27th Street Well	San Bernardino, City of	337.8	320.9	16.9
1519	3600719	1N4W27G01S	30th & Mtn. View	San Bernardino, City of	336.4	391.1	-54.7
1979	3602081	1N4W27B01S	31st & Mtn. View	San Bernardino, City of	354.5	389.7	-35.2
2066	3602422	1S4W02K08S	Antil Well #6	San Bernardino, City of	195.0	241.8	-46.8
2062	3602400	1N4W32N01S	Baseline Well	San Bernardino, City of	392.8	404.5	-11.7
1510	3600710	2N5W19K02S	Cajon Canyon Well	San Bernardino, City of	81.8	67.7	14.1
1910	3601844	1N5W03H02S	Cajon Well #2	San Bernardino, City of	188.9		
2115	3602821	1N5W03A02S	Cajon Well #3	San Bernardino, City of	196.6	197.4	-0.8
2008	3602206	1N4W06H02S	Devil Canyon #3	San Bernardino, City of	24.2	24.5	-0.3
2007	3602205	1N4W06H01S	Devil Canyon #4	San Bernardino, City of	36.8	42.7	-5.9
3139	G363790	1N04W32PS	EPA Extract Well 112	San Bernardino, City of	426.3		
1537	3600737	1S4W10N06S	Mill & D	San Bernardino, City of	220.3	228.0	-7.7
1514	3600714	1N4W16E01S	Newmark #1	San Bernardino, City of	245.2		
1516	3600716	1N4W16E03S	Newmark #3	San Bernardino, City of	243.3	249.4	-6.0
1647	3601115	1N4W26P03S	Perris Hill #5	San Bernardino, City of	288.0		
2448	9900045	1S4W23H	Brier/Gould/Tippecanoe	San Bernardino, City of / shallow wells			
		1S04W22C	Wastewater N MW #1	San Bernardino, City of / shallow wells			
1936	3601944	1N5W23Q01S	2/Lower 7	West Valley Water District	255.0	291.0	-36.0
1419	3603769	1N5W25E01S	5A/Lower 5	West Valley Water District	264.0	283.0	-19.0
1612	3600997	1N5W36H04S	7/Lord 7	West Valley Water District	408	464	-56.0

Annual Change in Storage for Bunker Hill Basin

Fall 2021 to Fall 2022

Sub-area	[1] Annual Change in Water Level 2022 [ft]	[2] Area [acres]	[3] Storativity (S)	[4] Annual Change in Storage** [acre-ft]
Bunker Hill I - Northeast of 215 Freeway	-0.6	7,795	0.11	-490
Bunker Hill I - Southwest of 215 Freeway	-7.4	11,714	0.09	-7,831
Bunker Hill II - West of Mentone Fault	-17.0	35,206	0.06	-35,909
Bunker Hill II - East of Mentone Fault, North	-12.2	8,584	0.13	-13,572
Bunker Hill II - East of Mentone Fault, South	-0.3	2,507	0.13	-93
Lytle Basin - Northwest of Barrier J	0.0	1,924	0.13	0
Lytle Basin - Southeast of Barrier J	-25.2	5,237	0.07	-9,220
Pressure Zone - North of Santa Ana Wash	-13.4	11,920	0.02	-3,206
Pressure Zone - Santa Ana Wash	-6.8	6,686	0.02	-910

Total =	-71,231
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[1] Based on average changes in water level within each Sub-area

[2] Estimated using GIS

[3] Based on data from Hardt and Hutchinson (1980).

S, storativity: The amount of water stored or released per unit area of aquifer given unit head change.

[4] = [1] x [2] x [3]

*A positive sign denotes an increase in water level and a negative sign represents a decline in water level.

Accumulated Change in Storage for Bunker Hill Basin

1989 to 2022 (Based on "Zero Year" of 1993)

Year	Accumulated Storage [acre-ft]
1989	-58,000
1990	-170,700
1991	-196,000
1992	-191,000
1993	0
1994	-50,000
1995	41,100
1996	-43,100
1997	-75,500
1998	40,400
1999	-85,700
2000	-131,100
2001	-212,200
2002	-301,500
2003	-338,800
2004	-406,900
2005	-183,100
2006	-245,500
2007	-359,400
2008	-362,000
2009	-397,600
2010	-340,623
2011	-224,603
2012	-314,377
2013	-444,322
2014	-535,877
2015	-583,447
2016	-566,555
2017	-522,930
2018	-570,718
2019	-418,310
2020	-486,185
2021	-580,031
2022	-651,262

Note: A negative sign indicates a decline in storage and a positive sign represents an increase in storage.

Production for Sub-basins of Bunker Hill Basin

Preceding Water Year (July 2021 to June 2022)

Sub-area	Production July 2020 to June 2021 [acre-ft] ²
Bunker Hill I - Northeast of Interstate 215	4,713
Bunker Hill I - Southwest of Interstate 215	10,653
Bunker Hill II - West of Mentone Fault	35,044
Bunker Hill II - East of Mentone Fault, North	3,686
Bunker Hill II - East of Mentone Fault, South	1,170
Lytle Basin - Northwest of Barrier J	934
Lytle Basin - Southeast of Barrier J	14,067
Pressure Zone - North of Santa Ana Wash	44,929
Pressure Zone - Santa Ana Wash	58,369
Total	173,565

Notes: 187 Wells Used in these Calculations

1 - Refer to Appendix C for Well Values Compiled for Estimate.

2 - Estimated for Water Year July 2021-June 2022 production.

Data Sources: 15 Primary Water Purveyors,
as well as San Bernardino Watermaster, and SBVMWD.

Estimates of Percentage of Normal Precipitation for Previous Water Year

July 2021 to June 2022

	[0]		[1]	[2]	[3]	[4]	[5]	[6]	[7]
	July to June		Season - July to December			Season - January to June			Jul. 2021- Jun. 2022
Station	Historic Average Annual	2021-2022	Historic Average	Sum Jul 2021 to Dec 2021	% of Normal	Historic Average	Sum Jan 2022 to Jun 2022	% of Normal	Water Year % of Normal
	[inches]	[inches]	[inches]	[inches]	[%]	[inches]	[inches]	[%]	[%]
Big Bear Dam	32.24	42.34	10.76	28.45	264%	21.48	13.89	65%	131%
Devore CDF	26.10	19.62	8.45	16.34	193%	17.65	3.28	19%	75%
Camp Angelus	23.35	23.15	8.17	18.64	228%	15.18	4.51	30%	99%
Lake Arrowhead	36.60	44.77	12.04	32.31	268%	24.56	12.46	51%	122%
Mentone CDF	12.28	7.22	3.81	5.22	137%	8.47	2.00	24%	59%
Redlands Country Club	12.01	7.82	3.92	5.98	153%	8.09	1.84	23%	65%
San Bernardino County Hospital	15.86	11.57	5.06	9.75	193%	10.80	1.82	17%	73%
Santa Ana Pumphouse #3	15.92	6.62	5.30	3.90	74%	10.62	2.72	26%	42%
Yucaipa CDF	14.50	10.28	4.51	7.47	166%	9.99	2.81	28%	71%

Avg (in) =	20.98	19.27
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Average =	186.2%
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Average =	31.2%
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2021-22 Average =	81.9%
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[1], [4]: Based on data provided by San Bernardino County Department of Transportation/Flood Control

[3] = ([2] / [1]) x 100

[5] = [0] - [2]

[6] = ([5] / [4]) x 100

[7] = (([2] + [5]) / ([1] + [4])) x 100

Average Annual Change in Storage for Bunker Hill Basin

Fall 2012 to Fall 2022

(The Immediate Past 10 Water Years)

Sub-area	[1] Average Change in 10 Years in Water Level* [ft]	[2] Area [acres]	[3] Storativity (S)	[4] Average Annual Change in Storage** [acre-ft]
Bunker Hill I - Southwest of 215 Freeway	-7.91	11,714	0.09	-8,149
Bunker Hill I - Northeast of 215 Freeway	-4.95	7,795	0.11	-4,240
Bunker Hill II - West of Mentone Fault	-5.76	35,206	0.06	-11,963
Bunker Hill II - East of Mentone Fault	-2.35	11,091	0.13	-3,385
Lytle Basin - Southeast of Barrier J	-5.57	5,237	0.07	-2,042
Lytle Basin - Northwest of Barrier J	-1.00	1,924	0.13	-251
Pressure Zone - North of Santa Ana Wash	-5.66	11,920	0.02	-1,349
Pressure Zone - Santa Ana Wash	-5.37	6,686	0.02	-718

Total = -32,099

[1] Based on average annual changes in water level within each Sub-area over last 10 years.

[2] Estimated using GIS.

[3] Based on data from Hardt and Hutchinson (1980).

S storativity: The amount of water stored or released per unit area of aquifer given unit head change.

[4] = [1] x [2] x [3]

*A positive sign is an increase in water level and a negative sign is a decline in water level.

Summary of Surface Distribution Water for Bunker Hill Basin
1994 to 2022

Streamflow Diversions	1994 [acre-ft]	1995 [acre-ft]	1996 [acre-ft]	1997 [acre-ft]	1998 [acre-ft]	1999 [acre-ft]	2000 [acre-ft]	2001 [acre-ft]	2002 [acre-ft]	2003 [acre-ft]	2004 [acre-ft]	2005 [acre-ft]	2006 [acre-ft]	2007 [acre-ft]	2008 [acre-ft]
Lytle Creek															
Fontana Union WC	12,601	9,893	10,730	7,266	8,626	9,695	4,131	5,829	2,906	3,029	3,774	4,439	12,203	6,516	6,727
Mount Vernon WC	102	0	0	0	0	312	786	778	975	1,442	754	70	250	437	927
Rialto, City of	843	44	1,070	393	896	1,461	NA	1,305	1,143	726	1,707	1,209	1,448	1,160	1,165
San Bernardino, City of		2,400	2,400	0	0	0	0	0	0	0	580	5	254	483	498
West Valley Water District	3,697	3,696	3,686	4,079	3,696	3,408	3,047	3,175	2,573	2,380	4,710	2,079	3,081	NA	3,369
Subtotal	17,243	16,033	17,886	11,738	13,218	14,876	7,964	11,087	7,597	7,577	11,525	7,802	17,236	8,596	12,686
Mill Creek															
Redlands, City of	14,505	9,786	12,250	10,250	11,224	11,951	8,852	9,496	5,867	12,541	10,168	12,574	15,409	9,607	12,332
SBVWCD Mill Creek Spreading	8,522	16,347	3,791	5,576	17,227	2,025	3,868	3,337	352	4,489	3,089	29,138	9,510	1,531	3,810
Subtotal	23,027	26,133	16,041	15,826	28,451	13,976	12,720	12,833	6,219	17,030	13,257	41,712	24,919	11,138	16,142
Bunker Hill Creeks															
Arrowhead Water & Power West Twin Crk											50	50	50	50	40
Arrowhead Water & Power East Twin Crk	2,225	9,277	3,273	4,451	9,734	2,276	1,420	1,339	616		2,500	1,750	1,700	1,725	3
Devore Water Company Kimbark Lower Cajon											29	97	80	62	68
Subtotal	2,225	9,277	3,273	4,451	9,734	2,276	1,420	1,339	616	0	2,579	1,897	1,830	1,837	111
Santa Ana River															
Bear Valley Mutual WC	23,812	30,794	38,252	31,479	36,632	30,245	29,498	26,301	23,458	12,633	11,227	12,516	17,689	11,560	13,519
Redlands Water Co				760							588	981	1,044	884	625
SBVWCD SAR Spreading	11,427	20,040	13,331	10,361	40,346	6,167	5,085	3,315	1,371	12,330	5,669	27,841	14,476	4,002	17,550
Subtotal	35,239	50,834	51,583	42,600	76,978	36,412	34,583	29,616	24,829	24,963	17,484	41,338	33,209	16,446	31,694
Imported Water Spreading															
Sweetwater basin	2,674	0	96	0	4	0	4,194	1,725	6,559	4,654	2,684	2,420	2,414	5,205	4,994
Badger Basin	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0
Waterman Basin	0	0	0	0	0	0	0	0	3,528	250	0	0	0	39	9,216
SBVWCD Santa Ana Basins	1,223	0	0	0	0	0	99	7,153	6,853	2,229	924	2,117	3,782	1,994	56
SBVWCD Mill Creek Basins								1,462	1,696					0	
Subtotal	3,897	0	96	0	4	0	4,297	10,340	18,636	7,133	3,612	4,537	6,196	7,238	14,266

Streamflow Diversions	2009 [acre-ft]	2010 [acre-ft]	2011 [acre-ft]	2012 [acre-ft]	2013 [acre-ft]	2014 [acre-ft]	2015 [acre-ft]	2016 [acre-ft]	2017 [acre-ft]	2018 [acre-ft]	2019 [acre-ft]	2020 [acre-ft]	2021 [acre-ft]	2022 [acre-ft]	Avg. [acre-ft]
Lytle Creek															
Fontana Union WC	5,776	10,052	18,037	7,656	3,775	3,586	3,407	3,236	3,075	2,921	3,087	5,479	3,813	1,967	6,353
Mount Vernon WC	1,132	167	685	578	520	468	421	379	341	307	276	276	276	276	446
Rialto, City of	1,135	1,000	1,148	1,319	996	1,020	871	1,041	1,206	1,133	950	1,509	1,230	1,529	1,095
San Bernardino, City of	450	450	0	0	0	0	0	0	0	0	0	1,853	0	0	335
West Valley Water District	2,435	3,322	3,382	2,954	2,369	3,810	3,389	1,737	2,516	2,291	5,717	3,851	2,807	3,372	3,237
Subtotal	10,928	14,991	23,252	12,507	7,660	8,884	8,088	6,393	7,138	6,652	10,030	12,968	8,126	7,144	11,465
Mill Creek															
Redlands, City of	7,785	10,076	13,492	6,085	7,041	4,657	3,912	4,400	6,121	5,818	5,650	6,045	5,459	5,285	8,919
SBVWCD MC	4,450	8,891	16,185	4,666	1,734	888	1,080	1,057	5,395	1,998	9,324	5,373	2,027	1,910	6,124
Subtotal	12,235	18,967	29,677	10,751	8,775	5,545	4,992	5,457	11,515	7,816	14,974	11,418	7,486	7,195	15,042
Bunker Hill Creeks															
Arrowhead Water & Power West Twin Crk	40	40	46	46	41	46	46	46	47	47	47	47	47	47	46
Arrowhead Water & Power East Twin Crk	0	0	1,097	1,097	987	889	800	720	648	583	525	472	425	383	1,818
Devore Water Company Kimbark	51	56	78	37	33	61	61	61	61	61	61	61	62	62	60
Subtotal	91	96	1,221	1,180	1,062	996	907	827	756	691	633	580	534	492	1,924
Santa Ana River															
Bear Valley Mutual WC	7,303	7,000	14,673	12,583	8,440	5,011	3,900	3,590	6,823	6,189	7,387	11,225	8,277	2,399	15,669
Redlands Water Co	654	629	739	4,917	2,036	5,201	5,629	6,957	6,059	5,845	5,032	5,796	3,610	2,807	3,040
SBVWCD SAR Spreading	8,456	21,662	36,801	9,073	5,519	1,537	2,982	2,766	20,924	2,618	35,688	18,377	5,194	8,245	12,867
Subtotal	16,413	29,291	52,213	26,573	15,995	11,749	12,511	13,312	33,806	14,651	48,108	35,398	17,081	13,451	31,576
Imported Water Spreading															
Sweetwater basin	3,002	3,983	4,457	6,413	4,514	1,672	4,933	6,286	6,083	1,683	2,819	1,446	0	2	2,928
Badger Basin	0		1,649	2,875	404	0	0	3,429	3,322	466	0	0	0	0	434
Waterman Basin	9,368	12,499	10,667	14,089	7,533	0	4,543	12,799	19,108	9,902	22,480	5,316	0	0	4,874
SBVWCD Santa Ana Basins	1,689	14	1,515	603	2	19	61	5,399	22,087	3,608	19,327	0	0	0	2,785
SBVWCD Mill Creek Basins	1,022	665	711	510	0	0	0	500	3,916	468	10,643	171	0	0	1,280
Subtotal	15,081	17,161	18,999	24,490	12,453	1,691	9,537	28,413	54,516	16,127	55,269	6,933	0	2	12,301

Assumed as average and are provisional data.

Total = 72,309

'23 Total = 28,284

Surface Diversions, comments:

The amount of water for surface distribution for the ensuing water year (October 1, 2023 to September 30, 2024) was estimated based on the average surface for the Santa Ana River, Bunker Hill Creeks, Mill Creek, and Lytle Creek for the period of 1990 to 2022. As shown in Table 8 above, the average surface diversion for the Santa Ana River, Bunker Hill Creek, Mill Creek , and Lytle Creek, including Department of Water Resources purchased water, between 1993 to 2022 was 37,003; 2,512; 17,549; 11,679 acre-feet respectively.